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COMPATIBILITY OF OIL AND GAS DEVELOPMENT IN THE NORTH SALTON SEA WITH FISH AND WILDLIFE RESOURCES

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Proposal

The proposal being addressed is to lease all or portions of 32 sections of T. 7 and 8 S., R. 9 and 10 E. in the north Salton Sea area (Riverside County) for oil and gas exploration and possible development. No definite exploration and/or development plans have been offered to date. The basic assumptions which will be made in this paper are that (1) offshore operations will be conducted similar to those of the Gulf of Mexico and Southern California offshore areas and (2) onshore operations will be similar to those used in other California fields.

Fishes of the Salton Sea

Since its creation in 1905, the Salton Sea has undergone a dramatic change in its fish fauna. Originally composed of predominantly freshwater forms, increased salinities have caused a shift to mainly saltwater forms.

The three dominant species today within the Salton Sea proper are the orangemouth corvina (Cynoscion xanthulus), sargo (Anistremus davidson) and Gulf croaker (Bairdiella icistia). These fish were all introduced into the Sea from the Gulf of California between 1949 and 1956 by the California Department of Fish and Game to establish a sport fishery (Walker 1961).

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A number of other fish species also occur in and around the Sea, although they are primarily restricted to the shallow edges and irrigation canals around the Sea. These include:

Sailfin molly	*Poecilia latapinna*
African cichlids	*Tilapia/Sarotherodon* sp.
Longjaw mudsucker	*Gillichthys mirabilis*
Red shiner	*Notropis lutrensis*
Desert pupfish	*Cyprinodon macularius*
Shortfin molly	*Poecilia mexicana*
Mosquitofish	*Gambusia affinis*
Porthole fish	*Poeciliopsis gracilis*
Carp	*Cyprinus carpio*
Threadfin shad	*Dorosoma petenense*
Yellow bullhead	*Ictalurus natalis*
Bluegill	*Lepomis macrochirus*

The desert pupfish (*Cyrpinodon macularius*) was first reported from the Salton Sea and associated desert springs by Evermann (1916) and remains the only native species of fish still found in the area. As recently as 1961 this species was still considered to be "abundant" at the Sea, especially in the shallow pools along its shoreline. However, incidental collections made by California Fish and Game and others since 1964 indicate that the populations of the desert pupfish at the Salton Sea and several surrounding springs have severely declined (Glenn Black, CDFG, pers. comm.). The cause of this may have been the introduction of exotic species that compete for food and space as well as prey on the desert pupfish. Recent quarterly surveys conducted by California Fish and Game (during 1978 and 1979) indicate that desert pupfish comprise 3% of the total catch from irrigation drains around the Sea, 5% of the total from shoreline pools and less than 1% from natural tributaries and the Salton Sea proper. The only apparent sanctuary is at San Felipe Creek, a tributary to the southwestern quadrant of the Sea, where 70% of the catch was made up of desert pupfish (Black, pers. comm.).

Because of the few numbers of fish species which actually exist within the Salton Sea proper, the food chain is relatively simple: phytoplankton - zooplankton - detritus - detritus eating worm (Neanthes) - worm-eating fish (Gulf croaker and sargo) - fish-eating fish (corvina). There is a second chain which passes directly from zooplankton to threadfin shad to corvina (Walker 1961).

The major fishery of the Sea is for the corvina, which is considered a prize game and food fish. These fish can be caught in almost any fashion, although trolling seems to be the preferred method. Sargo and Gulf croaker are also fished. Because corvina are primarily a schooling, pelagic species, they are highly mobile so that no specific areas seem to be any better fishing than others.

Since there is no outlet from the Sea, salinities have gradually increased to between 38,000 to 40,000 parts per million (ocean waters average 33,000 parts per million). At the present time this seems to pose the major threat to the Salton Sea fishery. High water temperatures (to 97° F.) and occasional low dissolved oxygen levels pose temporary and local threats, but the fish generally are able to avoid these areas.

Wildlife of the Salton Sea

The Salton Sea is a major wintering area for waterfowl. Marshes adjacent to the Sea at freshwater inlets provide nesting and wintering habitat for many birds including grebes, herons, rails, and songbirds. Flats and beaches around the Sea are used for foraging by large numbers of wintering shorebirds, terns, and gulls. Vagrant Bald Eagles (Haliaeetus leucocephalus), Brown Pelicans (Pelecanus occidentalis), Magnificent Frigatebirds (Fregata magnificens), Brown Boobies (Sula leucogaster), and Blue-footed Boobies (S. nebouxii) are occasionally seen along the Sea's perimeter (McCaskie 1970); both the Brown Pelican and Bald Eagle are on the federal and state endangered species lists. The Yuma Clapper Rail (Rallus longirostris yumanensis), which is on the federal endangered list and the state rare list, is known to occur at the Alamo River, New River, and Whitewater River deltas (McCaskie 1973). The California Black Rail (Laterallus jamaicensis coturniculus), also on the state rare list, has been recorded from Salt Creek, the New River and Alamo River deltas, and other marshes along the south shore (McCaskie 1974, McCaskie 1977).

Several species of frogs, toads, and turtles inhabit the freshwater marshes and deltas around the Sea. Mammals dependent on aquatic habitat and potentially in the Salton Sea area include the muskrat (*Ondatra zibethica*) and raccoon (*Procyon lotor*).

The Salton Sea National Wildlife Refuge in the southern Salton Sea and adjacent lands and the Wister State Waterfowl Refuge along the southeastern shore are major areas for sport hunting of waterfowl and upland gamebirds.

Impacts of the Proposal on Fishes

Offshore Operations: Basically offshore operations, as with any oil and gas operation, proceed through three phases. These are (1) Pre-exploration, (2) Exploration, and (3) Development (including production and transportation).

With the modern use of non-explosive energy sources for seismic surveys, the pre-exploratory phase should have minimal impact upon the fish of the Sea. Recent studies report that while explosive sources killed fish over an extensive area, the non-explosive sources tested caused no direct mortality (Weaver and Weinhold 1972, Falk and Lawrence 1973). The temporary presence of some sort of vessel towing a "sparker" or other such device on a cable would be expected to cause only minor, if any, inconvenience to local fishermen trolling the Sea for orangemouth corvina. This assumes that the tow vessel is of a similar size class as those which normally occur on the Sea.

The physical presence of exploratory drilling rigs or vessels along with the possible discharge of drill muds and cuttings during this phase may have a temporary and localized effect on the fish of the Sea. The attraction of fish to floating and submerged structures is a common occurrence; since drilling rigs are well lighted, this attraction may be greater at night.

Observations in the Gulf of Mexico indicate that fish are also attracted to drill cuttings as they cascade down through the water column where they may be sampled as food items and rejected. No definitive bioassays have yet been conducted with either drill muds or fish species found in the Sea to identify possible toxic components.

The physical presence of drilling rigs would decrease the surface area available to sport fishermen involved in trolling for corvina. Obviously, the area of the structure itself would not be available. Assuming the exploratory rig was anchored in place, a considerable additional area could be made unavailable to trolling. Using an eight point anchoring system and a 10:1 water depth to anchor radius ratio, as much as 18 surface acres per rig may be unavailable for corvina trolling. In the case of exploratory drilling, however, this would be temporary (2-3 months) for each site. It is expected that only one or two rigs would be on the Sea during this phase. Since corvina are highly mobile, pelagic species, it is expected that conflicts during the exploration phase would not be great.

Sewage and solid waste disposal may impact fish during the exploration phase. In the open ocean these impacts are reduced by current and wave actions. However, in an enclosed system such as the Salton Sea their impacts can be greatly magnified. A system already stressed by high water temperatures, high salinity levels, and pollution from agricultural drains, discharges of sewage and solid waste from oil and gas drilling rigs would only add to the cumulative impacts of these environmental stresses. If is therefore recommended that all sewage and/or solid waste be barged back to shore for disposal onshore.

The field development phase resulting from the proposed action may involve the installation of several offshore platforms. Development wells would be drilled from these platforms and, like exploration rigs, drilling muds and cuttings will be discharged into the sea. The function of oil drilling platforms as artificial reef structures is widely recognized and has been documented within the Santa Barbara Channel off Southern California. The platforms will attract fish almost immediately and, due to their semi-permanent nature, may act as artificial reefs with the establishment of a diverse community (Carlisle 1964). Discharged drill cuttings will form low mounds on the bottom within the immediate vicinity of the platform and may subsequently be mixed with the underlying sediment or colonized by benthic organisms (Zinguler 1975). As mentioned previously, the effects of drill muds on fish have yet to be conclusively established. In addition to platforms, sub-sea completions may be placed on the Sea foor in its deeper waters. Such structures may function similar to platforms and provide an artificial reef structure attractive to fish. An advantage of such structures is that no physical structure would be evident on the Sea surface, at least in depths greater than 17-30 feet (with the possible exception of marker buoys for navigational safety).

During the production phase of offshore operations, the structures have already been installed and fish may be affected through the disposal of formation waters which contain the soluble components of crude oil and trace amounts of certain heavy metals. Such discharges would increase from none during the early phases of field development and production to several million bbl/yr over a period of time. The Southern California Coastal Water Research Project has examined several of the various heavy metal components of formation waters of the Southern California area on marine organisms, including fish. However, analysis of the entire spectrum of formation water components and the effects of chronic discharges upon fish have not been done.

Because of the enclosed system represented by the Salton Sea, it is expected that the impacts of such discharges will be concentrated. Therefore, it is recommended that formation waters, like sewage and solid wastes, be barged or transported to shore for disposal.

The transportation phase in the Salton Sea is expected to involve primarily pipelines, although barge traffic would be possible. Temporary, localized increases in suspended sediment will occur as the pipe is being laid but is not expected to significantly affect the fish of the Sea. Barge transportation of oil would add vessels on the Sea and possibly conflict with recreational boaters (including fishermen).

If the proposed action leads to discovery of adequate gas and oil reserves to warrant field development and production, the greatest threat to fish resources of the Salton Sea would result from possible oil spills. This would include both chronic small spills as well as major catastrophic spills. Since we are currently addressing only a proposal to allow development and have no definite production scenario, it would be impossible to predict the number of large spills. It would probably be a prudent assumption to expect at least one major spill during the life of possible Salton Sea development. As we have indicated several times previously, due to the fact that the Sea is an enclosed "sink", the impacts of such an event could be devastating. Chronic small spills would be of as much concern, perhaps even more so, since the company(ies) involved may be less inclined to actively pursue clean-up activities for such spills. Since the only native fish to the Salton Sea, the desert pupfish, inhabits the shallow waters along the shoreline, oil blown up along shore by wind and/or wave action may greatly impact this species. Such impacts would be particularly severe since the desert pupfish populations are already suppressed due to competition with introduced fishes.

Onshore Operations: Generally, onshore oil and gas development within the north Salton Sea area would not be expected to impact fish of the sea with the following exceptions: Firstly, oil spills and/or chronic discharges of sewage and formation waters allowed to flow into or seep into the Sea itself would contribute to the general pollution of the Sea. Secondly, operations in the nearshore waters utilizing piers and/or jetties would have many of the same effects as offshore operations.

Impacts of the Proposal on Wildlife

Offshore Operations: The most serious impacts to wildlife of offshore drilling operations would occur as the result of an oil spill. The effects are difficult to predict as they are highly dependent on the volume of the spill, season of the year, direction and velocity of the wind, and corrective actions taken. The volume of the spill varies with the source - pipeline rupture, blowout, fire, or barge accident. Spills are most serious during the winter months when bird populations are highest and the effects of exposure are greatest.

Birds are the most sensitive to oil pollution and spills; there are a multitude of mechanisms resulting in death or decreased productivity. Death can result directly from the ingestion of oil if the bird becomes covered with it (Hartung and Hart 1966). Even small blotches of oil on the feathers can mat the feathers sufficiently to cause heat loss from the bird's body if it is on the water (Tuck 1960). The heat loss can cause death due to exposure or starvation as fat is rapidly consumed and feeding is suspended (Hartung 1967). When the plumage is oil-soaked, the feathers become waterlogged and the bird loses its ability to fly or even stay afloat (Erickson 1963, Chubb 1954). This can result in death due to drowning, starvation, or predation. The oiling of the plumage increases physiological stress on the birds and may result in death due to an unrelated cause or may prevent reproduction (Hartung 1965). Birds which are most susceptible are the water and shore birds such as gulls, terns, sandpipers, skimmers, pelicans, comorants, frigatebirds, grebes, ducks, and geese. Impacts are greatest on those species which are most dependent on water (Bourne 1968).

Oil spills can pollute wildlife habitats and cause long-term persistent effects. As winds blow the oil onto beaches and into marshes, the sediments and foliage become covered with oil residues. Sandpipers and gulls are the most affected by oil on beaches; unless very extensive, these birds can usually move to unpolluted beaches. However, as feeding grounds are lost, populations will decline. The estuaries and marshes around the Salton Sea are especially valuable and support large numbers of wintering waterfowl and aquatic and marsh birds not otherwise found in the desert. Since prevailing winds would likely push an oil slick south and east, the marshes of the Salton Sea National Wildlife Refuge and Wister State Waterfowl Unit would be highly vulnerable. Although north of the proposed offshore leasing areas, the Whitewater marsh, which supports the federally endangered Yuma Clapper Rail, is near the proposed leasing areas and could be polluted by small, chronic leakages as well as major spills. Similar contamination could occur in the Salt Creek estuary, immediately east of the lease area; state listed Black Rails have been recorded in the Salt Creek estuary. According to the 1975 Outer Continental Shelf ES (Vol. II, p. 201):

> If oil from a large spill were to enter an estuary, widespread death and destruction would result. The severity of the destruction would largely depend on the length of time oil remained in the semi-enclosed estuary, with its restricted circulation, before being cleaned up and its persistence in bottom sediments after clean-up. Clean-up operations would, of course, cause a certain amount of death. The amount of destruction is unquantifiable, while the time for biological recovery will be from one to several years and up to as many as ten years for mud and tidal flats.

Onshore Operations: Onshore operations will result in loss of habitat due to the rig and drilling operations, pipelines, and service roads. Such habitat losses are most critical in scarce or essential habitats and in areas where listed species occur. Both of these apply to the proposed leasing in T. 7 S., R. 9 E., S. 32 E. in the Whitewater River delta. Discharge of formation waters and sewage and oil spills could pollute marsh waters and significantly decrease bird densities and reproductive success. Other marsh fauna, such as insects, amphibians, and turtles will also be reduced by the resulting pollution.

Other facets of offshore operations, such as pipeline placement, transportation activities, and sewage disposal, impact wildlife directly where they occur in essential habitats such as marshes and estuaries. These areas should be and can be easily avoided. Where these activities significantly reduce plant, phytoplankton, or fish production, wildlife food supplies are reduced, and populations will decline.

Summary of Impacts

The pre-exploratory phase resulting from the proposal will have minimal, if any, impacts upon the fish and fishery resources of the Salton Sea.

During exploration and field development temporary and semi-permanent structures will most likely attract fish almost immediately acting as artificial reefs. The utility of such structures to local fishermen, however, is questioned. For safety reasons many oil companies are reluctant to allow fishermen to "tie-up" to these rigs or even fish close by. Nonetheless, the reef function of such structures may provide some benefits to the fishery.

The effects of discharges from temporary or semi-permanent structures necessary for field exploration or development (e.g., drill muds, cuttings, formation waters, sewage and/or solid wastes) are felt to offer significant impacts upon the Salton Sea ecosystem. Probably the greatest adverse impacts the proposal might have upon the fish and wildlife of the Salton Sea would result from oil spilled into the Sea. An enclosed system with no real means of "flushing" itself out, the Sea would be particularly susceptible to this type of pollution. Both chronic small spills and a catastrophic major spill are of concern. The latter may be "unavoidable"; however, the former is felt not to be and in the long run may have the potential to be just as devastating to the Salton Sea system. Careful prevention measures and an adherence to strict clean-up requirements should small spills occur could mitigate, but not eliminate, these impacts.

In our opinion, potential impacts on several listed species are sufficient to warrant Secton 7 consultation with the Fish and Wildlife Service. Species requiring consultation include the Yuma Clapper Rail (federal endangered) and Desert Pupfish (under federal status review, soon to be proposed).

Recommendations

1. It is recommended that the following tracts not be leased under any circumstances:

    T. 7 S., R. 9 E., Section 32 E 1/2
    T. 7 S., R. 10 E., Section 34 SW 1/4
    T. 8 S., R. 10 E., Section 2 (west of Highway 111)

    The purpose behind this recommendation is to protect sensitive wildlife habitat in the Whitewater river delta and along the northeastern shoreline and to protect harbor and sport fishing areas along the northeastern shoreline.

2. Provide a buffer (no oil and gas development) of at least 1 mile from the Sea shoreline.

    Purpose is to provide limited protection to shoreline marsh areas from disturbance and allow interception of possible oil spilled before reaching shore.

3. Lease remaining tracts, but only with the following stipulation(s):

   a. An oil spill contingency plan shall be prepared by the lessee, to the satisfaction of the lessor, prior to development phase.

   b. Equipment necessary to implement oil spill contingency plan shall be available in vicinity of oil development.

   c. Crew and equipment transportation shall be conducted in such a manner and via a route so as to minimize disturbance of significant wildlife resources (including habitat).

   d. Oil and/or gas pipelines shall be routed away from sensitive fish and wildlife habitat.

   e. No drilling muds, drill cuttings, formation water, solid waste or sewage shall be discharged directly into the Sea.

4. Should adequate discoveries be made during the exploration phase to warrant proceeding to field development, it is recommended that an Environmental Assessment Record be prepared based upon a specific and detailed development proposal including, among other things: (1) number and location of platforms, (2) number and location of wells, (3) mode of transportation of produced gas and/or oil; (4) methods of disposing of all waste produced during this phase, and (5) proposed measures to mitigate environmental impacts of the proposal.

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